UN World Economic Forecasting Model and the B&R Initiative

Regional Workshop on “Understanding and Assessing the Potential Macroeconomic Impact of the Belt and Road Initiative on Asian Economies”

October 21, 2019
Tbilisi

United Nations Development Programme
Our mission

• Extend the UN World Economic Forecasting Model (WEFM henceforth)
  • Structure and parameterization
• Asses impact of BRI on economic development of selected countries
• Simulate impact of investments in …
  • Infrastructure
    and
  • Human capital
• … on long-term growth, labor market, poverty reduction and environmental pollution…
• … while checking also on the fiscal sustainability
UN World Economic Forecasting Model

• Multi-country forecasting model
  • Emphasis on GDP forecast, including GDP components
  • Trade links among countries based on global trade matrix

• Error-correction principle
  • Behavioral equations to link four sectors: HH, firms, government and external sectors
  • EC framework guarantees stability of the system

• Those four sectors generate aggregate demand and supply
  • Supply side - potential output
    • Constant TFP growth assumption (3% for Kaz, Kgz)
    • Demand side – GDP including components

• Limited role for stabilization policy – fiscal and monetary policy
Modelling strategy

• Start with existing model
  • Too many changes can break down the existing model

• Create simplified (reduced-form) version of complex non-linear relationships for
  • Production function that includes government services in form of infrastructure investment as well as a measure of education level
  • Dependence of labor participation on GDP per capita and education level
  • Poverty reduction
  • Consumption and investment behavior in relation to expected growth and the real interest rate
  • Government debt accumulation and its impact on the country risk premium, real interest rate and the exchange rate with the back loop in private consumption and investment
  • Environmental impact
Supply side adjustments

• Following Agénor (2011), Fedderke and Bogetic (2009) and Hong and Li (2017), TFP is related to various types of investments
  • Government – proxy for infrastructure investment
  • Private investment
  • BRI related investment

• Overall investments decomposed/split into government and private
  • BRI related data supplied by the UNs National Consultants

• Overall labor market decomposed into male/female labor force participation
  • LFP related to (exogenous) skill ratio
Demand side adjustments

- Private consumption related to (expected) potential growth
  - The impact of RIR explicitly controlled, to account for potential government crowding-out effect

- Government interest rate payments on debt and government investments explicitly included in gvt spending
  - Equations for nominal, real interest rate and risk premium introduced
  - UIP condition to derive nominal IR
  - Risk premium is related to government debt
  - Risk premium also incorporated into the exchange rate
Development – poverty reduction and environmental impact

• Term Growth Model (LTGM v4.1) by Pennings (2018) is used for poverty considerations
  • Base on overly strict assumptions
    • Constant Gini coefficient;
    • Constant level of Poverty line, L;
  • However, useful to examine poverty dynamics

• Empirical papers showing CO₂ emissions related to per capita GDP, trade volume (as a % of GDP) and population growth
  • We cannot implement the hypothesis of inverted U-shaped Environmental Kuznets Curve, as very difficult to get U-shaped relationship in the model’s current environment
Simulation Experiment

• Creating a new baseline as a basis for future analysis
• Comparing the new and old baseline
  • This does not show the incremental effect of the BRI
• Forecast starting 2015
• External assumptions come from the global WEFM
• Use BRI data supplied by National Consultants for the history as well as for the future or used other assumptions
Data issues

- Following data was requested from National Consultants to input into the WEFM-e
  - Any BRI related investment data
  - “Critical” level of debt-to-GDP ratio (hypothetical value)
  - Absolute value of the national poverty line
  - Skill distribution of labor force

- In case when BRI data was not supplied/available, we assumed hypothetical values and spread it over 5 year horizon (2015-2020)

- In many cases, we have also used data from various sources (the WB, IMF, ILO, UN, etc.)
  - This ensures consistency of data across countries
Simulation results – Kazakhstan: improved economy

Investment growth

TFP growth

Potential output growth

GDP growth
Simulation results – Kazakhstan: improved economy

Deb-to-GDP ratio

Budget Balance

CO₂ emission (kt)
Simulation results – Kyrgyzstan: improved economy

**Investment growth**

- Original
- Modified

**TFP growth**

- Original
- Modified

**Potential output growth**

- Original
- Modified

**GDP growth**

- Original
- Modified
Simulation results – Kyrgyzstan: improved economy

Private consumption growth

Government consumption growth
Simulation results – Kyrgyzstan: improved economy

Debt-to-GDP ratio

Budget Balance

Poverty Headcount Rate

CO₂ emission (kt)
Summary of results

• Government is assumed to be inactive with policies
  • In reality, if the debt grows to high levels, government will adjust it’s fiscal policy to avoid debt distress
  • As the country reaches a certain development level, government will design (and implement) environmental policies, which will limit adverse effects of economic growth on environment

• BRI investments are more significant for Kyrgyzstan (16% of GDP) than for Kazakhstan (2.5% of GDP)
  • It has larger impact on Kyrgyz economy
  • Although, both countries enjoy improved economic activity driven by accelerated investment inflows
Summary – WEFM

• Key focus in the WEFM infrastructure is on forecasting GDP, with the focus on demand side
  • Less developed supply side and limited link between demand and supply
  • No focus on analyzing fiscal/monetary policy impact on the long term growth
  • However, this is not an issue for analyzing BRI impact

• Although TFP equation is introduced on the theoretical foundations, some important aspects might be still omitted
  • Because of the data issues, elasticity parameters are taken from other studies
  • In order not to distort model too much, majority of the original parameters are kept unchanged

• Despite all the challenges, the WEFM-e shows how infrastructure investment inflow can boost productivity, increasing the long term growth
  • If it will be accompanied with the prudent policies (fiscal/monetary), benefits can be even larger
Next Steps

• Incorporating feedback into model structure
• Training/hand-over seminars of the new model infrastructure
• Adjusting some issues with the original WEFM
• Simulating the effects of BRI on the next batch of countries
Thank you for your attention!
Simulation results – Kyrgyzstan: WEFM-e with and without BRI
Simulation results – Kyrgyzstan: WEFM-e with and without BRI

Budget balance

Debt to GDP ratio

RIR
UN World Economic Forecasting Model

- Population
- Labor supply
- Exogenous total factor productivity
- Potential output
- Output
- Output gap
- Inflation
- Interest rates
- Exchange rate against USD
- US inflation
- Shares on output
- Personal consumption
- Investment
- Government consumption
- Exports and imports
- Output per capita
- Labor participation
- Exports

Flow diagram showing the relationship between various economic indicators and factors.
Simulation results – Kazakhstan: additional charts

### Investment growth (Modified Model)

- **Infrastructure Inv**
- **Private**
- **Gvt**

### Trend productivity growth

- **Original**
- **Modified**

### Output gap

- **Original**
- **Modified**

### RIR
Simulation results – Kyrgyzstan: additional charts

Investment growth (Modified Model)

Trend productivity growth

Output gap

RIR